TABLE 4.—*Mean altitudes and temperatures of significant points identifiable as tropopauses during December 1940, classified according to the potential temperatures (10° intervals between 290° and 409° A.) with which they are identified (based on radiosonde observations)*—Continued

Stations	Miami, Fla.			Nashville, Tenn.			Nome, Alaska			Oakland, Calif.			Oklahoma City, Okla.			Omaha, Nebr.			Phoenix, Ariz.		
Potential temperatures °A.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.
290-299							17	6.7	−46.7												
300-309							14	8.3	−54.9	5	7.1	−38.2	1	7.4	−40.0	5	7.0	−38.2	1	7.2	−35.0
310-319	2	7.2	−26.5	8	9.2	−49.9	14	8.9	−56.0	7	8.6	−45.1	7	8.6	−45.3	21	8.9	−46.1	5	7.9	−39.2
320-329	6	9.1	−39.2	28	10.2	−52.9	3	9.4	−53.3	22	10.4	−54.7	24	10.3	−54.9	20	10.4	−55.0	17	10.0	−48.4
330-339	24	11.5	−56.0	12	11.6	−60.2	2	10.0	−50.0	12	11.4	−57.3	10	11.6	−59.0	7	11.0	−55.7	13	11.3	−55.2
340-349	13	12.9	−63.5	12	12.4	−61.7				1	13.1	−69.0	2	12.6	−63.0	4	12.5	−61.8	3	12.5	−58.3
350-359	10	14.0	−68.0	2	13.2	−63.0	1	11.4	−51.0	4	13.6	−66.0	4	13.4	−66.5	2	12.7	−58.0			
360-369	12	15.3	−75.9	2	14.4	−65.5	1	12.4	−59.0	3	13.5	−61.7	1	14.3	−65.0	1	14.1	−65.0	6	14.5	−68.8
370-379	3	15.8	−77.3	6	14.5	−66.0				2	17.7	−73.5	5	15.0	−68.6	2	14.8	−68.5	6	15.5	−71.3
380-389	7	16.4	−76.3	4	15.3	−67.5				4	15.3	−65.0	2	15.6	−70.5	2	14.7	−60.5	4	15.9	−72.8
390-399	3	16.6	−72.7	9	16.0	−68.1				6	15.7	−63.0	2	16.2	−70.0	5	15.1	−59.2	2	16.6	−72.0
400-409	4	17.2	−72.5	1	16.6	−72.0				5	16.2	−64.8	2	16.1	−64.5	4	15.8	−61.5	2	17.0	−72.0
Weighted means		13.3	−63.4		12.0	−58.9		8.2	−52.2		11.8	−56.7		11.6	−57.9		10.8	−53.1		12.1	−57.1
Mean potential temperature °A (weighted)	352.2			344.1			308.1			343.2			338.3			336.7			345.1		
Number days with observations	28			29			26			29			24			26			24		

Stations	Portland, Maine			San Diego, Calif.			Sault Ste Marie, Mich.			Seattle, Wash.			Atlantic Station No. 1			Late report, November 1940		
																Barrow, Alaska		
Potential temperatures °A.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.	Number of cases	Mean altitude (km.) m. s. l.	Mean temperature °C.
290-299	3	6.1	−38.7				9	6.6	−43.8							14	7.1	−49.7
300-309	11	7.6	−43.5				9	6.9	−39.2	9	8.3	−51.3	1	7.6	−45.0	28	8.2	−52.6
310-319	21	8.8	−48.0	2	8.6	−42.0	18	9.6	−56.1	14	9.1	−51.4	8	8.9	−44.9	19	9.4	−57.2
320-329	22	10.2	−54.7	10	10.2	−53.3	12	10.4	−58.0	20	10.4	−55.2	12	10.2	−53.1	12	10.7	−61.7
330-339	10	11.4	−60.5	11	11.1	−55.7	1	10.9	−57.0	5	11.5	−59.8	10	11.7	−60.7	2	11.2	−59.5
340-349	2	11.4	−55.0	3	12.1	−56.7	3	11.4	−56.0	1	12.0	−58.0	3	12.8	−65.7	2	11.2	−55.0
350-359				1	12.3	−53.0				1	12.0	−57.0	3	12.8	−60.3	1	11.6	−55.0
360-369	1	12.7	−58.0	2	14.1	−64.5							1	14.8	−71.0	1	12.2	−54.0
370-379	3	14.7	−65.0	1	14.6	−64.0	2	13.0	−53.5	1	13.4	−57.0	3	14.1	−61.7			
380-389	2	14.2	−57.5	1	15.5	−65.0	4	14.0	−57.8				3	15.4	−67.7			
390-399	3	15.3	−62.7							1	15.1	−62.0	5	16.0	−67.0			
400-409	1	15.3	−58.0	1	17.2	−72.0	4	15.1	−57.2	2	15.4	−58.5	2	16.6	−66.0	1	14.6	−53.0
Weighted means		10.0	−52.3		11.4	−55.7		9.8	−52.3		10.2	−54.4		12.0	−57.9		9.0	−54.8
Mean potential temperature °A. (weighted)	327.2			337.8			325.7			325.5			343.9			312.4		
Number days with observations	26			20			23			30			17			29		

Information contained in footnotes to Table 1 are also applicable to Table 4.

AEROLOGICAL OBSERVATIONS FOR THE YEAR 1940

By EARL C. THOM

At the end of 1940, radiosonde observations were being made at 26 Weather Bureau stations and at 5 Navy stations, while 3 other Navy stations were using airplanes to record upper-air conditions. At the end of the previous year radiosonde observations were being made at 25 Weather Bureau stations, 3 Navy stations and 1 Army station, while 6 Navy stations were making airplane observations. Changes were made in the location of several Weather Bureau radiosonde stations in the United States and several new stations were established in Alaska during the latter months of the year. The stations at which upper air observations were made during each month of the year are shown in Table 4 which tabulates the number of observations made at the various stations.

Valuable upper air data were obtained during the 1940 hurricane season from radiosonde observations made at San Juan, Puerto Rico as well as from special observations made at several of the regular radiosonde stations. Upper air data were also obtained in the ocean area between 40° to 52° N. latitude and 47° to 55° W. longitude from radiosonde observations made by United States Coast Guard Cutters while on ice patrol duty.

Radiosonde observations were begun in May as part of a regular weather reporting service established on board Coast Guard Cutters in the Atlantic Ocean in areas, termed Atlantic Stations No. 1 and No. 2. For the location of these stations the reader is referred to the footnote of table 4.

Monthly mean values of temperature, pressure, and relative humidity for all the standard levels of the free air have been published each month as Table 1 under Aerological Observations in the MONTHLY WEATHER REVIEW.

Table 1 for the year 1940, tabulates annual mean pressures, temperatures, and relative humidities for all stations for which such data were available during the entire

year as well as for Juneau where such observations were not made during the months of July and August. The annual mean values shown in Table 1 are computed by averaging the corresponding mean monthly values so that data for all months are given the same weight. The reader may find the number of observations for each month and level by referring to the previously published monthly tables.

Annual mean values for both 1939 and 1940 are available for twelve stations in the United States. These stations are shown in the annual table No. 1 for each of these 2 years and are as follows: El Paso, Tex., Lakehurst, N. J., Nashville, Tenn., Norfolk, Va., Oakland, Calif., Oklahoma City, Okla., Omaha, Nebr., Pensacola, Fla., San Diego, Calif., Sault Ste. Marie, Mich., Seattle, Wash., and Washington, D. C.

Based on the available annual mean values it is found that temperatures at standard levels from the surface to 2,000 meters, inclusive, were higher in 1940 than in 1939 over the southwestern part of the United States and were generally lower than last year over the eastern half of the country at these levels. At standard levels, from 3,000 meters to 9,000 meters, 1940 temperatures were generally lower than last year.

At most stations the annual mean relative humidities at all levels were several percent higher than last year. In this connection it is noted that precipitation for the country as a whole was considerably below normal in 1939 and somewhat above normal in 1940.

At levels 3,000 meters and lower the annual mean pressures were either the same or lower in 1940 than in 1939 at nine of the stations for which data are available. At Seattle, where the greatest decrease was noted, the annual mean pressure averaged nearly 3 millibars lower than last year at these levels. At three stations, Sault Ste. Marie, Omaha, and Oklahoma City the corresponding annual mean pressures averaged about 1½ millibars higher than in 1939.

At the end of 1940, observations were being made 4 times daily at nearly all of the 132 Weather Bureau pilot-balloon stations. Of these stations 123 were in the United States proper, 7 in Alaska, 1 in Puerto Rico and 1 in Swan Island. This represented an addition in the number of pilot-balloon stations since the end of 1939 of 25 stations in the United States, 3 in Alaska and 1 in Swan Island. Pilot-balloon work was moved from Elmira, N. Y., to Binghamton, N. Y., during the year. All pilot-balloon stations were using helium gas for inflation at the end of the year.

To extend still further the Weather Bureau investigations of winds at higher levels of the free air, more stations were equipped during the year with the larger 100-gram balloons for use in making the 5 p. m. (e. s. t.) observations. The higher ascensional rate of these ballons is resulting in observations of wind conditions at much higher levels than formally. The number of stations using the 100-gram balloons was 12 at the end of 1938, 27 at the end of 1939 and 41 at the end of 1940.

All Weather Bureau pilot-balloon data which were reduced to punch card form by the W. P. A. Weather Project at New Orleans during 1939 were tabulated and summarized by the project during 1940. About 14 million regular hourly surface airway observations were coded and reduced to punch cards by the project in 1940 and in addition charts and tables showing summaries of pilot-balloon and surface airway observations were prepared in final form and the printing of the "Meteorological Atlas of the Airways" was begun.

During the first 8 months of the year the minimum free-air temperatures published were those selected from the temperatures recorded only at "standard" levels, while during the remainder of the year minimum temperatures for the month were selected from the lowest temperature recorded over each station at any level. The lowest published free-air temperature over the United States, −84.2° C. (−119.6° F.) was observed at 16,400 meters (m. s. l.) over Miami, Fla., on November 30. A lower temperature, −92.6° C. (−134.5° F.) was, however, observed over Swan Island at 17,800 meters on December 28. The corresponding minimum temperatures recorded in 1939 were −80.6° C. over Atlanta, Ga., for the United States, and −85.1° C. over Swan Island.

Monthly resultant wind directions and velocities have been computed for the 1,500- and 3,000-meter levels from the 5 a. m. (e. s. t.) observations for all stations and have been shown each month in the MONTHLY WEATHER REVIEW on charts VIII and IX. Similar 5 p. m. resultants have been computed for the 5,000- and 10,000-meter levels and shown on charts X and XI. Monthly resultants (5 p. m., e. s. t.) have also been computed for all levels at 39 selected stations. These resultants have been published regularly in the REVIEW as table 2 of the Aerological Summary. The list of stations furnishing data for table 2 was revised, early in the year 1940, to conform as closely as practicable with the radiosonde stations then in operation.

The 1940 annual 5 p. m. resultants are shown in table 2 for the selected list of stations. At most of the standard levels below 5,000 meters stations located in the western third of the country had annual resultant directions this year considerably to the southward of the corresponding 1939 resultants and somewhat to the southward of normal while the opposite was true for these levels at most stations to the eastward. At the 2,000- and 2,500-meters levels the 1940 annual resultant velocities were higher than the corresponding 1939 values over the southwest and along the upper Pacific coast and were generally lower than the previous year at these levels for other stations.

In the southwestern part of the United States where annual resultant wind velocities were higher in 1940 than in 1939 and where the turning of the annual resultant winds was to the north of normal in 1939 and to the south of normal in 1940, the annual precipitation for this area was below normal in 1939 (California 67 percent of normal, Arizona 93 percent of normal) while precipitation was much above normal in 1940 (California 156 percent of normal, Arizona 124 percent of normal).

Table 3 shows the maximum free-air wind velocities and their directions for various sections of the United States during the year 1940, as determined by pilot balloon observations. The extreme velocity for the year 98.4 meters per second (220 miles per hour). This velocity was 2.9 meters per second higher than the corresponding extreme of 1939. In both 1939 and 1940 the extreme wind velocity for the year occurred above 5,000 meters (m. s. l.). During the years 1939 and 1940 at levels lower than 2,500 meters the extreme wind velocity was 57.5 meters per second while for the same period at levels between 2,500 meters and 5,000 meters this extreme was 67.4 meters per second. When the maximum wind velocities for the nine sections of the country

are averaged by each of the four seasons of 1940 it is found that winter is the season of highest wind velocities at all levels, and that at levels above 2,500 meters Autumn has the next highest winds, while Summer is the season of lowest maximum wind velocities at all levels.

Table 4 gives a tabulation by months of the altitude of the level at which a mean temperature of 0° C. was observed at all stations making either airplane or radiosonde observations. The level of mean freezing temperature was the highest in July when it was observed at a minimum elevation of 2,900 meters over Sault Ste. Marie and sloped upward to a maximum of 5,300 meters over Phoenix. The level of freezing during the month of July 1940 was 800 meters lower over Sault Ste. Marie than during the same month of 1939 and was 300 meters lower over San Antonio.

More detailed comparison of upper-air conditions during the year, of 1939 and 1940 can be made by reference to the 1939 Annual Summary of Aerological Observations which was published in the MONTHLY WEATHER REVIEW for December 1939.

TABLE 1.—*Mean free-air barometric pressure in millibars, temperature in degrees centigrade, and relative humidities in percent, obtained by airplanes and radiosondes during year 1940*

Altitude (meters) m. s. l.	Stations and elevations in meters above sea level																							
	Bismarck, N. Dak. (505 meters)				Charleston, S. C. (14 meters)				Denver, Colo. (1,616 meters)				El Paso, Tex. (1,194 meters)				Ely, Nev. (1,908 meters)				Joliet, Ill. (178 meters)				Juneau, Alaska (49 meters)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	348	957	3.3	79	346	1,016	14.0	86	346	838	6.8	70	338	882	15.6	46	346	810	5.6	60	332	996	6.2	84	276	1,007	5.5	74
500					345	960	15.1	70													331	957	7.3	74	276	950	3.2	74
1,000	348	901	5.8	69	345	904	12.9	65													331	901	5.8	71	274	895	−0.2	76
1,500	348	847	4.6	65	345	852	10.5	63					338	851	16.7	44					331	847	4.0	70	271	841	−2.7	78
2,000	348	796	2.6	64	345	802	8.3	59	345	800	9.0	62	338	802	13.8	42	346	801	7.5	56	330	796	1.8	68	260	789	−5.3	78
2,500	348	749	0.3	62	345	755	6.0	57	345	753	6.4	58	338	756	10.6	42	346	754	7.0	51	329	748	−0.4	65	253	740	−7.9	77
3,000	348	703	−2.3	61	345	710	3.5	54	345	708	3.3	57	338	711	7.1	44	346	709	3.7	51	328	703	−2.8	62	247	693	−10.8	74
4,000	346	619	−8.2	58	342	627	−1.6	48	344	624	−3.5	60	335	629	0.0	45	344	626	−3.2	50	325	619	−8.1	57	238	608	−16.8	68
5,000	345	544	−14.6	55	342	552	−7.4	45	338	550	−10.3	61	335	554	−6.9	46	342	551	−10.3	50	325	543	−14.2	54	227	532	−23.5	65
6,000	339	476	−21.4	53	339	485	−13.6	43	334	482	−17.1	58	332	487	−13.6	43	341	483	−17.4	49	321	475	−20.9	51	212	463	−30.6	
7,000	336	414	−28.8	51	338	425	−20.4	42	331	421	−24.3	56	328	426	−20.5	40	339	422	−24.7	47	312	414	−28.1	49	204	401	−37.9	
8,000	320	359	−36.5		334	370	−27.8	41	328	367	−31.7	54	325	372	−27.9	39	336	367	−32.3	44	303	360	−35.4		185	346	−44.9	
9,000	309	310	−43.9		329	321	−35.3		324	317	−39.6		323	322	−35.4		330	317	−39.9		289	311	−42.5		169	297	−50.6	
10,000	296	267	−50.6		324	278	−42.8		317	274	−46.8		319	280	−42.8		324	274	−47.2		274	268	−48.9		163	254	−53.8	
11,000	285	229	−54.9		315	239	−49.7		302	235	−52.6		314	240	−49.7		319	235	−53.4		260	229	−53.6		143	218	−53.5	
12,000	274	195	−56.6		306	205	−55.1		284	201	−56.1		309	206	−55.1		315	201	−57.1		248	196	−56.4		130	187	−51.5	
13,000	255	166	−57.1		293	175	−59.4		272	172	−58.3		304	176	−59.2		300	171	−58.9		226	167	−57.8		122	160	−50.3	
14,000	239	142	−57.1		284	148	−62.6		251	146	−59.7		296	149	−62.5		293	146	−60.0		209	142	−58.7		109	137	−50.2	
15,000	209	122	−57.8		265	126	−65.1		229	124	−61.3		284	127	−65.7		285	124	−61.5		194	121	−59.7					
16,000	186	104	−58.4		252	107	−66.8		208	106	−62.2		274	108	−67.8		269	106	−62.4		171	104	−60.5					
17,000					224	91	−67.1		180	90	−62.1		232	91	−67.9		226	90	−62.3		140	87	−60.5					
18,000					196	77	−65.7						167	77	−66.0		147	77	−61.4									

Altitude (meters) m. s. l.	Stations and elevations in meters above sea level																							
	Lakehurst, N. J.[1] (39 m.)				Medford, Oreg. (401 m.)				Nashville, Tenn. (180 m.)				Norfolk, Va.[1 2] (3 m.)				Oakland, Calif. (2 m.)				Oklahoma City, Okla. (391 m.)				Omaha, Nebr. (301 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	363	1,012	6.8	83	330	968	12.3	69	345	996	11.6	78	282	1,019	11.7	78	346	1,016	13.2	81	342	971	12.0	75	348	982	8.1	75
500	363	956	7.0	70	330	957	12.6	67	345	959	12.1	73	282	961	11.4	65	346	958	13.1	74	342	958	12.7	72	348	959	8.7	70
1,000	363	900	5.3	67	330	901	11.5	61	345	903	10.1	71	281	905	8.9	61	346	902	13.5	58	342	903	12.3	63	348	902	8.1	65
1,500	362	846	3.3	64	330	849	8.8	61	345	850	8.0	69	278	852	6.5	59	345	850	11.7	51	342	851	10.7	59	348	849	6.6	62
2,000	362	796	1.4	61	330	799	6.0	62	345	800	5.9	67	276	801	4.3	54	345	800	9.2	46	341	801	8.8	55	346	798	4.7	60
2,500	361	747	−0.6	57	330	751	3.5	59	345	752	3.7	63	276	753	1.9	49	345	753	6.4	42	341	754	6.3	52	346	751	2.3	58
3,000	359	702	−2.7	54	330	706	0.8	55	342	707	1.3	60	276	708	−0.7	46	345	708	3.5	39	340	709	3.5	51	345	706	−0.3	56
4,000	353	618	−7.9	51	326	623	−5.3	50	337	624	−4.0	56	269	624	−6.0	40	344	626	−2.5	37	335	626	−2.6	50	344	622	−6.1	55
5,000	342	542	−13.7	49	324	548	−11.6	46	333	549	−9.9	52	198	549	−11.7	36	343	551	−9.1	36	333	551	−9.0	47	341	547	−12.2	52
6,000	340	474	−20.2	48	319	480	−18.4	44	330	482	−16.2	49					342	483	−16.0	36	330	484	−15.8	44	336	479	−18.8	49
7,000	340	414	−27.2	49	315	419	−25.8	43	329	421	−23.1	47					341	422	−23.3	35	326	423	−22.9	42	331	418	−25.8	47
8,000	336	360	−34.2		308	364	−33.6		325	366	−30.4	47					340	368	−31.1	35	324	368	−30.5	41	329	363	−33.3	
9,000	332	311	−41.1		297	314	−41.2		321	318	−38.1						338	318	−39.0		315	319	−38.2		327	314	−40.8	
10,000	322	268	−47.3		289	271	−48.3		313	274	−45.1						335	275	−46.7		307	275	−45.8		319	271	−47.6	
11,000	312	230	−52.2		276	232	−54.0		302	236	−51.3						329	236	−53.2		300	236	−52.3		309	232	−52.9	
12,000	299	197	−55.5		258	198	−57.6		298	202	−55.8						322	201	−57.6		287	202	−57.0		305	199	−55.9	
13,000	284	168	−57.6		245	169	−59.0		291	172	−58.9						320	172	−59.8		276	172	−60.2		290	170	−57.6	
14,000	268	144	−59.1		233	144	−59.3		276	147	−61.1						315	146	−60.7		256	146	−62.7		268	145	−58.8	
15,000	241	122	−59.8		215	123	−60.4		262	125	−62.8						302	124	−61.9		235	125	−65.3		246	123	−60.1	
16,000	211	104	−60.4		196	105	−61.1		245	106	−63.8						286	106	−63.2		210	106	−66.8		228	105	−60.7	
17,000	178	89	−60.0		178	89	−61.0		218	90	−63.8						258	90	−63.0		186	90	−66.7		183	90	−60.8	
18,000									186	77	−63.3						204	76	−62.0		153	76	−65.2		151	76	−60.2	
19,000																	136	65	−61.1									

See footnotes at end of table.

TABLE 1.—*Mean free-air barometric pressure in millibars, temperature in degrees centigrade, and relative humidities in percent, obtained by airplanes and radiosondes during year 1940*—Continued

Altitude (meters) m. s. l.	Stations and elevations in meters above sea level																							
	Pearl Harbor, T. H.[1 2] (6 m.)				Pensacola, Fla.[1 3] (24 m.)				Phoenix, Ariz. (339 m.)				San Diego, Calif.[1] (19 m.)				Sault Ste. Marie, Mich. (221 m.)				Seattle, Wash.[1 3] (27 m.)				Washington, D. C.[1] (7 m.)			
	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity	Number of observations	Pressure	Temperature	Relative humidity
Surface	364	1,014	21.8	85	347	1,016	17.0	79	348	973	19.8	47	346	1,012	16.2	82	347	990	2.1	86	309	1,013	11.4	78	333	1,017	8.6	78
500	364	959	20.8	79	347	961	16.2	69	348	955	22.9	42	346	957	15.3	68	347	956	2.5	83	309	957	10.3	68	333	958	8.9	68
1,000	364	905	17.5	81	347	906	14.0	64	348	902	21.5	38	346	902	15.6	50	347	899	0.7	80	308	902	7.9	65	333	902	7.1	67
1,500	364	853	15.0	74	347	854	11.7	59	348	851	18.0	37	345	850	14.4	39	346	844	−1.3	78	306	848	5.0	66	332	848	5.1	66
2,000	364	804	12.3	62	347	804	9.6	53	348	802	14.2	39	344	801	12.2	35	346	792	−3.4	76	302	798	2.2	66	332	798	3.2	62
2,500	364	757	11.8	44	346	756	7.2	48	348	755	10.6	40	344	754	9.5	33	346	744	−5.6	74	300	749	−0.6	63	332	749	1.1	58
3,000	364	714	9.9	32	346	712	4.6	46	347	711	7.3	41	329	710	6.5	33	346	697	−7.9	71	297	703	−3.2	58	330	704	−1.2	55
4,000	361	632	4.9	23	333	629	−1.1	44	342	629	0.5	42	312	630	0.0	34	341	612	−13.2	67	285	619	−8.9	55	330	620	−6.5	53
5,000					278	554	−7.1	43	341	554	−6.3	41	295	553	−7.0	35	338	536	−19.1	63	274	543	−15.2	54	328	545	−12.3	52
6,000					248	487	−13.3	43	339	487	−13.3	40	290	486	−13.8	39	333	468	−25.8	60	261	475	−21.6	54	321	477	−18.7	52
7,000					241	426	−20.2	44	337	426	−20.5	39	285	425	−21.1	42	327	407	−32.8		252	414	−26.8	57	315	417	−25.5	52
8,000					224	372	−27.4	46	333	372	−28.1	37	271	370	−28.7		323	352	−39.8		235	360	−36.1	54	229	362	−32.6	
9,000					215	323	−34.6		327	322	−35.9	36	264	321	−36.3		314	304	−46.2		211	311	−43.1		220	314	−39.7	
10,000					193	279	−41.8		312	279	−43.4		255	278	−43.5		306	261	−51.3		194	268	−49.1		191	270	−46.1	
11,000					174	241	−48.8		300	240	−50.2		240	239	−50.2		293	224	−54.1		171	230	−53.1		151	232	−51.5	
12,000									288	206	−55.4		227	204	−55.6		276	191	−55.2		151	197	−54.5		106	199	−55.5	
13,000									275	175	−59.0		199	175	−59.6		258	164	−55.6		142	169	−54.5					
14,000									258	149	−61.9		180	149	−62.3		243	140	−56.0		130	145	−55.0					
15,000									240	127	−64.6		160	127	−64.9		211	120	−56.8									
16,000									214	108	−66.8		135	108	−66.5		168	103	−57.3									
17,000									179	91	−67.1																	
18,000									140	77	−65.6																	

[1] Navy stations.
[2] Airplane observations.
[3] Raobs and Apobs.

At some stations data were missing during 1 or 2 months at higher levels. Data were not published for any level where observations were missing for 2 months in the same season.

NOTE.—All data are based on observations during 12 months except at Juneau, for which only 10 months data were available.

TABLE 2.—*Free-air resultant winds based on pilot balloon observations made near 5 p. m. (75th meridian time) during the year 1940. Directions given in degrees from North (N=360°, E=90°, S=180°, W=270°)—Velocities in meters per second*

Altitude (meters) m. s. l.	Abilene, Tex. (537 m.)			Albuquerque, N. Mex. (1,630 m.)			Atlanta, Ga. (299 m.)			Billings, Mont. (1,095 m.)			Bismarck, N. Dak. (512 m.)			Boise, Idaho (870 m.)			Brownsville, Tex. (7 m.)			Buffalo, N. Y. (220 m.)			Burlington, Vt. (132 m.)			Charleston, S. C. (18 m.)			Chicago, Ill. (192 m.)			Cincinnati, Ohio (157 m.)			Denver, Colo. (1,627 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	353	187	1.3	362	256	1.6	344	290	1.4	354	304	1.0	357	324	0.9	353	316	1.7	344	119	3.8	341	262	2.7	351	240	0.7	344	195	1.1	333	288	1.2	352	256	1.3	358	38	0.8
500							344	284	1.7										344	128	4.2	341	257	4.3	347	250	2.4	343	218	1.9	333	276	1.5	352	253	2.4			
1,000	350	190	2.0				334	276	2.4				349	303	1.9	353	319	1.6	315	149	2.4	305	261	5.6	330	267	4.1	330	255	3.0	299	264	3.4	318	252	3.5			
1,500	343	215	2.3				315	278	3.3	354	277	2.1	313	295	2.6	353	289	1.3	280	198	0.9	261	268	5.9	285	280	5.2	310	268	4.2	271	272	4.9	297	264	5.1			
2,000	326	236	3.1	362	252	2.1	291	282	4.6	344	276	3.4	273	289	4.2	346	265	2.3	230	255	1.4	230	278	7.0	236	286	6.5	273	276	5.7	242	280	6.1	266	271	6.3	358	17	.9
2,500	312	259	4.4	358	265	2.8	270	287	6.2	327	277	5.3	256	295	6.4	325	260	4.0	203	258	2.3				165	294	7.1	253	277	6.3	222	283	7.5	235	280	7.4	347	325	1.2
3,000	300	272	5.6	350	277	4.0	226	285	7.3	317	276	6.6	232	293	8.1	303	257	5.1										219	276	7.6	187	287	8.8	204	286	9.0	341	297	2.5
4,000	272	281	7.9	313	289	6.2	239	284	9.5	279	278	10.0	187	296	10.8	247	254	6.8																			319	293	6.5
5,000	251	285	9.6	281	288	8.3	214	284	12.7	236	281	12.2				206	259	8.1																			285	292	9.5
6,000	225	286	10.6	257	289	9.6	199	281	13.9	206	284	13.4																									244	291	11.6
8,000	183	284	12.6	210	289	11.6																															180	292	14.8
10,000				159	286	13.2																																	

Altitude (meters) m. s. l.	El Paso, Tex. (1,196 m.)			Ely, Nev. (1,910 m.)			Grand Junction, Colo. (1,413 m.)			Greensboro, N. C. (271 m.)			Havre, Mont. (766 m.)			Jacksonville, Fla. (14 m.)			Las Vegas, Nev. (570 m.)			Little Rock, Ark. (79 m.)			Medford, Oreg. (410 m.)			Miami, Fla. (10 m.)			Minneapolis, Minn. (261 m.)			Mobile, Ala. (10 m.)			Nashville, Tenn. (194 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	364	245	1.5	354	210	1.6	350	310	1.3	323	268	1.2	329	272	0.9	344	96	1.2	366	148	1.6	347	153	0.5	341	310	1.0	361	93	1.9	344	286	0.8	358	170	1.0	333	274	1.1
500										323	258	2.0				340	165	0.9				346	217	0.9	341	309	1.2	360	94	2.1	344	278	1.3	355	204	1.3	333	257	1.5
1,000										317	259	3.3	329	263	2.2	322	247	2.1	366	161	1.7	325	232	2.0	339	256	0.9	352	93	0.8	312	281	2.4	326	278	1.3	322	257	2.4
1,500	364	247	1.9				350	308	1.4	314	273	4.6	329	266	4.5	302	269	3.7	363	185	1.9	308	265	3.0	334	216	2.2	338	274	0.6	296	280	3.9	308	295	2.6	302	268	3.5
2,000	361	253	2.3	354	213	1.9	350	295	1.6	296	283	6.4	320	269	5.6	286	276	4.6	357	215	2.7	297	279	4.1	321	216	3.6	318	267	1.7	262	286	5.6	288	298	3.7	279	280	4.6
2,500	358	263	3.2	353	222	2.5	344	263	2.2	270	288	8.3	298	266	6.8	276	277	5.7	351	230	3.2	273	283	5.4	289	213	4.2	311	268	2.7	231	291	7.5	271	290	4.8	256	283	6.1
3,000	345	267	4.1	346	234	2.9	338	255	3.3	254	289	9.7	268	268	8.0	270	277	6.7	345	243	4.0	244	290	6.9	262	219	4.4	300	262	3.7	196	297	9.3	256	284	6.2	228	288	7.5
4,000	312	273	5.5	316	257	4.6	300	268	5.0	224	288	12.2	191	271	9.8	249	277	8.8	334	255	5.4	214	292	9.6				278	263	5.4				209	277	7.2	154	288	8.5
5,000	258	273	6.7	268	264	6.4	248	279	6.7							232	276	10.9	318	264	6.9	140	294	9.3				250	265	7.1				167	275	8.1			
6,000	202	276	7.9	223	264	6.5										205	277	13.4	299	269	8.2							223	266	8.6									
8,000				169	276	9.7													247	270	9.8																		
10,000																			208	273	11.0																		
12,000																			175	266	14.0																		

TABLE 2.—*Free-air resultant winds based on pilot balloon observations made near 5 p. m. (75 meridian time) during the year 1940. Directions given in degrees from North (N=360°, E=90°, S=180°, W=279°)—Velocities in meters per second*—Continued

Altitude (meters) m. s. l.	New York, N. Y. (15 m.)			Oakland, Calif. (8 m.)			Oklahoma City, Okla. (402 m.)			Omaha, Nebr. (306 m.)			Phoenix, Ariz. (344 m.)			Rapid City, S. Dak. (982 m.)			St. Louis, Mo. (181 m.)			San Antonio, Tex. (183 m.)			San Diego, Calif. (15 m.)			Sault Ste. Marie, Mich. (230 m.)			Seattle, Wash. (14 m.)			Spokane, Wash. (603 m.)			Washington, D. C. (10 m.)		
	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity	Observations	Direction	Velocity
Surface	337	287	2.1	347	249	0.6	339	173	1.5	355	287	0.2	364	248	0.9	345	3	2.0	338	259	1.0	358	117	1.2	346	281	3.6	318	299	2.0	334	255	1.3	330	216	1.8	341	287	1.3
500	335	281	3.5	345	274	2.3	339	169	1.9	355	278	0.3	364	246	1.2	---	---	---	337	261	2.1	358	118	1.7	346	288	2.7	318	293	2.8	334	212	1.4	---	---	---	341	282	2.7
1,000	306	288	5.7	332	263	1.9	337	197	2.3	332	260	1.4	364	238	1.5	345	1	2.1	316	255	3.0	346	146	1.1	323	274	1.3	288	288	3.5	304	203	2.7	330	212	2.5	320	276	4.5
1,500	280	293	7.3	320	250	2.0	325	230	3.0	308	261	3.2	362	227	1.8	344	321	2.8	293	265	4.3	323	200	1.1	307	267	0.8	250	294	3.8	274	204	3.4	318	224	3.5	292	283	6.8
2,000	221	297	8.3	308	246	2.1	314	252	4.2	283	268	5.0	358	229	2.3	321	302	3.6	274	275	5.5	300	252	2.0	294	255	1.5	---	---	---	235	210	3.9	294	230	4.3	261	288	8.3
2,500	---	---	---	300	246	2.4	306	267	5.3	270	281	6.5	353	242	2.5	306	295	5.2	250	287	6.6	279	264	3.1	281	250	1.9	---	---	---	213	215	4.1	247	240	4.9	241	287	9.9
3,000	---	---	---	293	251	2.9	285	275	6.6	260	287	7.8	349	255	3.0	295	293	7.2	217	289	7.4	266	277	4.2	261	252	2.9	---	---	---	179	224	4.5	222	246	5.8	216	287	10.8
4,000	---	---	---	274	256	4.4	255	284	8.5	229	297	10.6	317	270	3.3	254	294	9.3	---	---	---	240	287	6.2	234	254	4.1	---	---	---	---	---	---	176	255	8.2	164	288	12.3
5,000	---	---	---	250	259	5.6	230	293	10.4	200	298	13.1	283	275	4.2	223	291	11.5	---	---	---	201	286	7.6	215	255	4.8	---	---	---	---	---	---	---	---	---	---	---	---
6,000	---	---	---	---	---	---	206	295	12.5	173	301	14.6	239	277	5.3	---	---	---	---	---	---	185	286	9.7	161	261	5.4	---	---	---	---	---	---	---	---	---	---	---	---
8,000	---	---	---	---	---	---	---	---	---	---	---	---	169	275	6.1	---	---	---	---	---	---	138	280	12.6	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

TABLE 3.—*Maximum free air wind velocities (m. p. s.), for different sections of the United States based on pilot balloon observations during the year 1940*

Section	Surface to 2,500 meters (m. s. l.)						Between 2,500 and 5,000 meters (m. s. l.)						Above 5,000 meters (m. s. l.)					
	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Month	Station	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Month	Station	Maximum velocity	Direction	Altitude (m.) m. s. l.	Date	Month	Station
Northeast [1]	47.0	WSW	2,100	12	Nov.	Buffalo, N. Y.	62.4	WNW	3,610	22	Nov.	Binghamton, N.Y.	70.4	WNW	5,870	18	Dec.	Caribou, Maine.
East Central [2]	48.8	NW	2,240	10	Mar.	Washington, D. C.	63.9	NW	5,000	14	Feb.	Greensboro, N. C.	97.8	W	12,014	28	Nov.	Greensboro, N. C.
Southeast [3]	43.0	WNW	1,730	14	Feb.	Charleston, S. C.	55.6	SW	5,000	14	Nov.	Atlanta, Ga.	86.0	W	9,990	15	Jan.	Atlanta, Ga.
North Central [4]	47.5	NW	2,150	6	Dec.	Rapid City, S. Dak.	51.4	SW	4,600	6	July	Alpena, Mich.	80.0	WNW	9,830	21	Feb.	Rapid City, S. Dak.
														NW	7,730	22	Mar.	Fargo, N. Dak.
Central [5]	46.4	W	2,260	12	Nov.	Moline, Ill.	60.0	NW	4,960	25	Feb.	Moline, Ill.	74.0	W	11,580	27	Nov.	Wichita, Kans.
South Central [6]	41.2	NNW	2,470	1	May	Oklahoma City, Okla.	65.8	NNW	4,390	27	Dec.	Abilene, Tex.	78.0	WNW	21,230	12	Sept.	San Antonio, Tex.
Northwest [7]	41.3	W	1,972	6	May	Pocatello, Idaho.	55.8	W	3,200	5	Dec.	Havre, Mont.	80.0	WNW	9,380	21	Feb.	Billings, Mont.
West Central [8]	43.8	S	2,080	3	Nov.	Modena, Utah.	61.8	WNW	3,330	6	July	Casper, Wyo.	98.4	N	11,120	22	Nov.	Winnemucca, Nev.
Southwest [9]	57.5	NW	2,278	25	Dec.	Roswell, N. Mex.	49.9	WNW	5,000	11	Nov.	Albuquerque, N. Mex.	86.0	NNW	7,120	22	Jan.	Albuquerque, N. Mex.

[1] Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, and northern Ohio.
[2] Delaware, Maryland, Virginia, West Virginia, southern Ohio, Kentucky, eastern Tennessee, and North Carolina.
[3] South Carolina, Georgia, Florida, and Alabama.
[4] Michigan, Wisconsin, Minnesota, North Dakota, and South Dakota.
[5] Indiana, Illinois, Iowa, Nebraska, Kansas, and Missouri.
[6] Mississippi, Arkansas, Louisiana, Oklahoma, Texas (except extreme west Texas), and western Tennessee.
[7] Montana, Idaho, Washington, and Oregon.
[8] Wyoming, Colorado, Utah, northern Nevada, and northern California.
[9] Southern California, southern Nevada, Arizona, New Mexico, and extreme west Texas.

TABLE 4.—*Monthly mean heights of freezing temperatures (0° C.) during year 1940, from mean monthly values based on Airplane and Radiosonde observations*

Stations	Elevation in meters (m. s. l.)	January		February		March		April		May		June		July		August		September		October		November		December	
		Number of observations	Altitude in hundreds of meters (m. s. l.)	Number of observations	Altitude in hundreds of meters (m. s. l.)	Number of observations	Altitude in hundreds of meters (m. s. l.)	Number of observations	Altitude in hundreds of meters (m. s. l.)	Number of observations	Altitude in hundreds of meters (m. s. l.)	Number of observations	Altitude in hundreds of meters (m. s. l.)	Number of observations	Altitude in hundreds of meters (m. s. l.)	Number of observations	Altitude in hundreds of meters (m. s. l.)	Number of observations	Altitude in hundreds of meters (m. s. l.)	Number of observations	Altitude in hundreds of meters (m. s. l.)	Number of observations	Altitude in hundreds of meters (m. s. l.)	Number of observations	Altitude in hundreds of meters (m. s. l.)
Albuquerque, N. Mex.	1,620	31	21	29	24	30	32	30	35	30	42	29	48	13	49	----	----	----	----	----	----	----	----	----	----
Anchorage, Alaska	41	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	27	11	30	(1)	----	(5)
Atlanta, Ga.	300	31	(1)	29	22	31	28	30	33	31	36	29	43	10	43	----	----	----	----	----	----	----	----	----	----
Atlantic Station No. 1 [2]	2	----	----	----	----	----	----	----	----	28	37	30	42	28	45	22	43	23	42	20	32	20	30	26	29
Atlantic Station No. 2 [3]	2	----	----	----	----	----	----	----	----	27	32	30	38	25	42	27	44	27	42	26	37	14	31	14	26
Barrow, Alaska	6	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	15	1	30	(1)	----	(5)	----	(5)
Billings, Mont.	1,089	31	(1)	29	(1)	31	20	28	24	29	33	29	41	14	45	----	----	----	----	----	----	----	----	----	----
Bismarck, N. Dak.	505	31	(1)	29	(1)	31	(1)	30	14	31	30	29	40	13	43	31	44	29	42	31	30	30	(1)	31	(1)
Boise, Idaho	824	31	[4] 10	28	17	31	23	29	26	31	36	29	44	13	47	----	----	----	----	----	----	----	----	----	----
Brownsville, Tex.	6	----	----	----	----	----	----	----	----	----	----	----	----	----	----	27	50	30	49	30	46	26	44	30	39
Buffalo, N. Y.	220	29	(1)	29	(1)	31	(1)	28	11	27	25	29	36	12	32	----	----	----	----	----	----	----	----	----	----
Charleston, S. C.	14	31	13	29	26	31	31	28	34	31	38	30	45	13	45	29	49	30	45	31	37	30	38	30	33
Dayton, Ohio	150	22	(1)	24	(1)	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Denver, Colo.	1,616	31	(1)	29	[4] 20	31	27	30	30	31	38	28	46	13	48	29	47	28	45	31	38	30	[4] 25	31	[4] 24
El Paso, Tex.	1,193	31	28	29	30	31	34	30	38	29	42	30	48	13	50	20	49	30	47	31	41	30	35	31	33
Ely, Nev.	1,908	31	(1)	29	(1)	29	26	30	30	31	40	30	46	13	49	31	48	29	40	30	35	30	(1)	31	(1)
Fairbanks, Alaska	153	30	(1)	28	(1)	31	(1)	29	15	31	18	29	25	13	28	----	----	----	----	----	----	----	----	----	(5)
Great Falls, Mont.	1,117	----	----	----	----	----	----	----	----	----	----	----	----	----	----	31	43	30	38	31	29	30	(1)	28	[4] 16
Joliet, Ill.	178	31	(1)	26	(1)	28	(1)	29	19	28	27	28	38	13	39	26	44	29	38	27	31	30	10	31	(1)
Juneau, Alaska	49	31	2	28	1	31	(1)	29	13	30	14	29	18	12	24	----	----	----	----	24	13	24	2	30	5
Ketchikan, Alaska	26	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	27	17	28	8	21	9
Lakehurst, N. J.	39	29	(1)	29	(1)	31	(1)	30	15	31	30	29	39	29	42	30	43	30	35	30	27	30	19	30	14
Medford, Oreg.	401	28	22	28	19	31	23	30	23	31	33	29	44	13	44	18	46	29	34	30	31	30	23	31	23
Miami, Fla.	4	31	37	29	40	31	41	29	43	30	44	29	46	13	47	----	----	----	----	----	----	28	47	30	40
Minneapolis, Minn.	263	31	(1)	29	(1)	31	(1)	29	16	30	26	27	40	12	40	----	----	----	----	----	----	----	----	----	----
Nashville, Tenn.	180	31	(1)	29	14	23	23	30	30	30	34	29	42	12	43	31	47	30	41	31	37	28	28	31	27
Nome, Alaska	14	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	28	(1)	28	(1)	----	(5)
Norfolk, Va.	10	19	(1)	15	12	23	8	27	23	24	31	26	40	25	43	26	43	24	40	22	32	23	25	20	24
Oakland, Calif.	2	31	26	29	24	31	29	30	30	31	37	29	44	13	46	31	47	29	40	31	36	29	32	30	29
Oklahoma City, Okla.	391	30	(1)	29	22	29	29	28	34	31	39	30	45	13	48	31	47	27	44	28	37	29	30	31	30
Omaha, Nebr.	301	31	(1)	29	(1)	31	6	29	25	31	31	30	43	13	45	30	44	29	42	30	35	30	17	31	[4] 17
Pensacola, Fla.	24	28	27	28	29	30	34	27	38	31	40	30	44	30	47	22	45	9	42	23	36	21	37	27	34
Phoenix, Ariz.	339	31	30	29	29	31	34	30	36	30	43	30	49	13	53	31	51	29	47	30	40	28	35	30	33
Portland, Me.	19	----	----	----	----	----	----	----	----	----	----	30	35	12	32	----	----	----	----	----	----	28	8	31	(1)
St. Louis, Mo.	171	31	(1)	29	(1)	31	17	30	27	31	32	30	44	13	45	----	----	----	----	----	----	----	----	----	----
San Antonio, Tex.	174	31	30	29	33	31	37	30	42	31	43	29	47	12	48	----	----	----	----	----	----	----	----	----	----
San Diego, Calif.	19	29	32	28	29	28	33	29	35	29	42	26	47	30	47	12	49	11	45	31	42	30	36	28	34
Sault Ste. Marie, Mich.	221	31	(1)	29	(1)	31	(1)	30	6	31	22	30	31	13	29	30	37	28	31	31	17	30	(1)	31	(1)
Seattle, Wash.	10	22	17	26	14	23	15	24	19	27	28	24	35	20	34	31	39	21	33	27	25	26	16	31	17
Shreveport, La.	51	25	5	18	29	17	29	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Spokane, Wash.	598	31	(1)	29	11	31	18	30	21	30	29	29	38	11	42	----	----	----	----	----	----	----	----	14	18
Swan Island, W. I.	10	----	----	----	----	----	----	----	----	----	----	----	----	----	----	29	50	28	50	----	----	(5)	30	48	----
Washington, D. C.	7	27	(1)	28	7	31	6	29	21	31	31	30	40	30	43	18	45	20	37	30	30	29	22	30	23

[1] Surface.
[2] In or near the 5° square: Lat. 35°00′ N. to 40°00′ N.; long.: 55°00′ W. to 60°00′ W.
[3] In or near the 5° square: Prior to Nov. 14, 1940, lat. 40°00′ N. to 45°00′ N., long. 40°00′ W. to 45°00′ W. Subsequent to Nov. 13, 1940, lat. 35°00′ N. to 40°00′ N., long. 45°00′ W. to 50°00′ W.
[4] Mean monthly temperature at surface was 0° C. or lower, above which was an inversion with mean temperatures above freezing.
[5] Data not yet received.

Airplane observations were received from Pearl Harbor, T. H., throughout the year and from Coco Solo and St. Thomas for several months, but the level of average freezing was not reached at these stations.

RIVER STAGES AND FLOODS

By BENNETT SWENSON

Precipitation during December 1940 was well above normal in the Gulf States and from Missouri, Oklahoma, and Texas, westward to the Pacific coast. Frequent rains, heavy at times, in Mississippi and eastern Texas resulted in protracted high-river stages and moderate flooding. In eastern Texas this was the second consecutive month with abnormally heavy precipitation and flooding. In California, although the first half of the month was dry, excessive rainfall during the latter half brought the state average to 9 inches, nearly 2½ times the normal and the greatest for this month since 1894.

Atlantic slope drainage.—Moderate to heavy rains for 4 days, beginning with December 26, over the upper Susquehanna Basin, caused rising stages with some slight flooding in this area.

East Gulf of Mexico drainage.—Frequent rains over the Pearl River basin during the month, being heavy from the 12th to the 16th, resulted in flood stages beginning on the 16th and continuing into the next month. There were two principal rises; Jackson, Miss., cresting at 24.4 feet on the 23d and at 25.2 feet on the 29th, while Pearl River, La., reached a stage of 15.0 feet on the 21st and after subsiding slightly the stages again rose near the end of the month.

Red Basin.—The Sulphur River was in flood at the beginning of the mouth, the crest of the rise being 27.4 feet on November 29 at Naples, Tex. Two other rises occurred during December and stages of 27.1 and 27.4 feet were reached on December 20 and January 1, respectively. Losses have been estimated at $6,000.

West Gulf of Mexico drainage.—Following moderate to heavy floods in eastern Texas during November (see previous issue of REVIEW) flood stages, or high stages again prevailed during December. These were due to frequent rains, heavy at times, during the month.

At Dallas, the Trinity River exceeded flood stage on three separate occasions during November and December. However, levees protected the city and since there were no growing crops at this time of the year the property loss was slight. The three crests at Dallas were as follows: 32.4 feet on November 26, 33.5 feet on December 16, and 33.2 feet on December 28.

There were two overflows at Trinidad, Tex., the first one extending from November 24 to December 25, with a crest stage of 35.6 feet on November 27, and the second